

First Named inventor: Chen et al.

Application No.: 09/728.038

Confirmation No.: 2584

Filed: December 1, 2000

Title: Apparatus and Method for Controlling Delivery of Slurry to a Region of a Polishing Device

Group Art Unit: 3723

Examiner: GRANT, A.

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Dear Sir:

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June 4, 2003
Date  Gero G. McClellan

**PETITION TO WITHDRAW HOLDING OF ABANDONMENT
BASED ON FAILURE TO RECEIVE RESPONSE TO
FINAL OFFICE ACTION UNDER MPEP 711.03(c)**

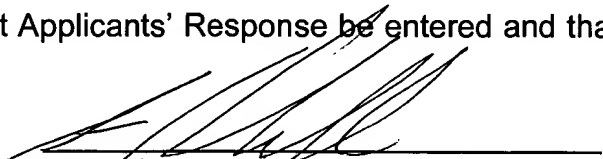
The above-identified application became abandoned on April 23, 2003. A Notice of Abandonment was mailed on May 21, 2003. The stated cause of the abandonment is Applicants' failure to respond to Office Action Dated October 23, 2003.

Respectfully, Applicants submit that it did not cause the abandonment. Instead, the above-identified application was abandoned due to the misplacement, at the Patent and Trademark Office, of the Applicants' timely Response to Final Office Action Dated October 23, 2002 (Applicants' Response) mailed on January 23, 2003. The six month statutory due date for the Applicants' Response was April 23, 2003. The undersigned attorney (Attorney) telephoned the Examiner on numerous occasions to determine the status of the application. The Attorney was informed that the response had not been received by the Examiner. After a review of Applicants' file, it was determined that the

Response had been received by the Patent Office on January 29, 2003, as indicated by the date stamped on the post card received from the Patent Office. On April 21, 2003, Applicants sent via facsimile to the Examiner, the Response and a copy of the date-stamped post card acknowledging receipt of the Response at the Patent Office. The Examiner then was able to locate the original Response to the Final Office Action, which had been misrouted, and indicated the Applicants would have sufficient time to respond timely following the Examiner's action. However, an Examiner's Advisory Action was not mailed until May 9, 2003, after the statutory period for response had expired. Accordingly, Applicants did not have an opportunity to response timely. Further, the remarks of the Advisory Action are not consistent with the Applicants' Response on which the Advisory Action is presumably based. The Advisory Action refers to "reversal of rotation of the platen", which is not an element of any amendment in the claims of the Applicants' Response, nor even of any pending claim. Accordingly, Applicants believe the Advisory Action is improper and HEREBY PETITION TO WITHDRAW HOLDING OF ABANDONMENT OF THIS APPLICATION PURSUANT TO MPEP 711.03(C).

Pursuant to MPEP 711.03(C) the undersigned attorney submits that Applicants' Response was timely filed. A copy of the Response to Final Office Action Dated January 23, 2003 is attached hereto as EXHIBIT A and a copy of the date-stamped post card indicating receipt of Applicants' Response in the Patent Office is attached hereto as EXHIBIT B.

The requirements for this petition having been fulfilled, Applicants respectfully request that this petition be granted and that Applicants' Response be entered and that the claims be allowed.



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**In re Application of:
Chen et al.**

Serial No.: 09/728,038

Confirmation No.: 2584

Filed: December 1, 2000

For: Apparatus and Method for Controlling Delivery of Slurry to a Region of a Polishing Device

BOX AF
Commissioner for Patents
Washington, D.C. 20231

Group Art Unit: 3723

Examiner: Grant, A.

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Gero G. McClellan

Dear Sir:

RESPONSE TO FINAL OFFICE ACTION DATED OCTOBER 23, 2002

In response to the Final Office Action dated October 23, 2002, having a shortened statutory period for response set to expire on January 23, 2003, please enter this response and reconsider the claims pending in the application for reasons discussed below. The Commissioner is hereby authorized to charge counsel's Deposit Account No. 20-0782/3778/CMP/CMP/GGM in the amount of \$84.00, or for any fees, including extension of time fees or excess claim fees, required to make this response timely and acceptable to the Office.

IN THE CLAIMS:

1. An apparatus, comprising a semiconductor polishing device having a first surface defining at least two non-intersecting fluid retaining grooves at least a portion of which is

oriented at an angle relative to a radial line originating at a center of the semiconductor polishing device, wherein the non-intersecting fluid retaining grooves are adapted to flow a fluid inwardly toward a center portion of the semiconductor polishing device.

2. The apparatus of claim 1, wherein the semiconductor polishing device is one of a polishing pad and a platen.
3. The apparatus of claim 1, wherein a depth of at least one of the non-intersecting fluid retaining grooves changes along a length of the at least one non-intersecting fluid retaining groove.
4. The apparatus of claim 1, wherein at least one of the non-intersecting fluid retaining grooves has a first portion and a second portion having a same direction of curvature and defining a tangent point to the radial line.
5. The apparatus of claim 1, wherein the non-intersecting fluid retaining grooves are oriented in a direction of rotation moving at an increasing radius from a first end of the grooves to a second end of the grooves.
6. The apparatus of claim 1, wherein the non-intersecting fluid retaining grooves are oriented in a direction of rotation moving at an increasing radius along a length of the non-intersecting fluid retaining grooves.
7. The apparatus of claim 1, wherein the non-intersecting fluid retaining grooves are selected from arcuate grooves, linear grooves, and any combination thereof.
8. The apparatus of claim 1, wherein the non-intersecting fluid retaining grooves extend from the center portion of the semiconductor polishing device to an edge of the semiconductor polishing device and wherein no point of the non-intersecting fluid retaining groove is tangent to the radial line.

9. The apparatus of claim 1, wherein the semiconductor polishing device is adapted for use with a rotary polisher.
10. The apparatus of claim 1, wherein the semiconductor polishing device is adapted for use with a linear polisher.
11. The apparatus of claim 1, wherein the semiconductor polishing device is a polishing pad and the first surface is a polishing surface.
12. The apparatus of claim 1, wherein the semiconductor polishing device is a platen and the first surface is a polishing pad mounting surface.
13. The apparatus of claim 1, wherein the semiconductor polishing device is a platen and the first surface is a polishing pad mounting surface having a perforated pad disposed thereon, wherein a plurality of perforations formed in the perforated pad couple the non-intersecting fluid retaining groove with a polishing surface of the perforated pad.
14. A substrate polishing pad, comprising:
 - (a) a polishing surface on a first side of the substrate polishing pad; and
 - (b) a mounting surface on a second side of the substrate polishing pad;wherein at least one of the polishing surface and the mounting surface has a plurality of non-intersecting fluid retaining grooves formed therein, wherein the grooves are disposed so that upon a given direction of movement of the substrate polishing pad a fluid disposed in the grooves is urged to flow from an outer portion toward a center portion of the substrate polishing pad.
15. The substrate polishing pad of claim 14, wherein the one or more fluid retaining grooves extend from the center portion of the substrate polishing pad to an edge of the substrate polishing pad and wherein no point of the grooves is tangent to a radial line extending from a center to the substrate polishing pad.

16. The substrate polishing pad of claim 14, wherein the grooves are formed on the mounting surface and the substrate polishing pad comprises perforations extending between the polishing surface and the mounting surface.
17. The substrate polishing pad of claim 14, wherein the substrate polishing pad comprises polyurethane.
18. The substrate polishing pad of claim 14, wherein the substrate polishing pad is adapted for use with a rotary polisher.
19. An apparatus for polishing a substrate, comprising:
- (a) one or more rotatable platens;
 - (b) a motor coupled to the rotatable platens;
 - (c) one or more polishing heads rotatably mounted in facing relation to the rotatable platens; and
 - (d) a polishing pad disposed on each of the rotatable platens,
- wherein at least one of the rotatable platens and the polishing pads comprise a plurality of non-intersecting fluid retaining grooves formed on a first surface thereof and wherein at least a portion of the grooves are disposed at an angle to a radial line extending from a center of the first surface and are adapted to flow a fluid inwardly from an outer portion to a center portion of the first surface.
20. The apparatus of claim 19, wherein the plurality of non-intersecting fluid retaining grooves comprise a plurality of arcuate grooves extending from the center portion to the outer portion.
21. The apparatus of claim 19, wherein the plurality of non-intersecting fluid retaining grooves are selected from the group of arcuate grooves, linear grooves and any combination thereof.

22. The apparatus of claim 19, wherein the plurality of non-intersecting fluid retaining grooves is selected from the group of:

- (a) arcuate grooves;
- (b) linear grooves disposed in an angular relation to the radial line; and
- (c) a combination of (a) and (b).

23. The apparatus of claim 19, wherein the first surface is a platen mounting surface of the polishing pad in mating abutment with a pad mounting surface of the platen and further comprising a plurality of holes formed through the polishing pad and coupling the plurality of non-intersecting fluid retaining grooves with a polishing surface of the polishing pad.

24. The apparatus of claim 19, wherein the first surface is a pad mounting surface of the platen in mating abutment with a platen mounting surface of the polishing pad and further comprising a plurality of holes formed through the polishing pad and coupling the plurality of non-intersecting fluid retaining grooves with a polishing surface of the polishing pad.

25. The apparatus of claim 19, wherein the plurality of non-intersecting fluid retaining grooves is selected from the group of:

- (a) arcuate grooves;
- (b) linear grooves disposed in non-parallel relation to a radial line extending from a center of the polishing pad or platen; and
- (c) a combination of (a) and (b).

26. The apparatus of claim 19, wherein the plurality of non-intersecting fluid retaining grooves comprise a first portion oriented at a first angle greater than 0 degrees and less than 90 degrees relative to the radial line and a second portion oriented at a second angle greater than 90 degrees and less than 180 degrees relative to the radial line.

27. The apparatus of claim 26, wherein the first and second angles vary along their respective lengths.
28. A rotatable platen for a polishing system, comprising a patterned pad mounting surface forming a plurality of non-intersecting fluid retaining grooves each having a portion oriented at an angle relative to a radial line originating at a center of the pad; the portion adapted to flow a fluid inwardly from a perimeter portion to a center portion of the platen during rotation of the platen.
29. The rotatable platen of claim 28, wherein the plurality of non-intersecting fluid retaining grooves is selected from the group of:
- (a) arcuate grooves;
 - (b) linear grooves disposed in angular relation to the radial line; and
 - (c) a combination of (a) and (b).
30. The rotatable platen of claim 28, wherein a polishing pad is mounted on the pad mounting surface so that the polishing pad and the plurality of non-intersecting fluid retaining grooves form fluid passageways between the polishing pad and the platen.
31. The rotatable platen of claim 28, wherein the rotatable platen is part of a chemical mechanical polishing system.
32. An apparatus, comprising a semiconductor polishing device having a first surface defining at least one non-intersecting fluid retaining groove at least a portion of which is oriented at an angle relative to a radial line originating at a center of the semiconductor polishing device, and wherein the non-intersecting fluid retaining groove has a first portion and a second portion having a same direction of curvature and defining a tangent point to the radial line and wherein the non-intersecting fluid retaining groove is adapted to flow a fluid inwardly toward a center portion of the semiconductor polishing device.

33. The apparatus of claim 32, wherein the semiconductor polishing device is one of a polishing pad and a platen.

34. The apparatus of claim 33, wherein a depth of the non-intersecting fluid retaining groove changes along a length of the non-intersecting fluid retaining groove.

35. The substrate polishing pad of claim 14, wherein at least one of the one or more fluid retaining grooves has a first portion and a second portion having a same direction of curvature and defining a tangent point to a radial line extending from a center to the substrate polishing pad.

36. The substrate polishing pad of claim 14, wherein at least one of the one or more fluid retaining grooves has a first portion and a second portion having a same direction of curvature and defining a tangent point to a radial line extending from a center to the substrate polishing pad; and wherein at least one other of the one or more fluid retaining grooves extend from the center portion of the substrate polishing pad to an edge of the substrate polishing pad and wherein no point of the at least one other of the one or more fluid retaining grooves is tangent to the radial line.

Please add the following new claims:

37. An apparatus for polishing a substrate, comprising:

- (a) a rotatable platen;
- (b) a motor coupled to the rotatable platen;
- (c) a polishing head rotatably mounted in facing relation to the rotatable platen; and
- (d) a polishing pad disposed on the rotatable platen, wherein a plurality of non-intersecting slurry retaining grooves are formed at an interface between the polishing pad and the rotatable platen and wherein a first portion of the grooves are oriented to flow slurry inwardly from an outer region to an interior region at the interface between the polishing pad and the respective rotatable platens for a given direction of

rotation of the platen, and wherein a second portion of the grooves are oriented to flow slurry outwardly from a central region to the interior region at the interface between the polishing pad and the rotatable platen for the given direction of rotation of the platen.

REMARKS

This is intended as a full and complete response to the Final Office Action dated October 23, 2002, having a shortened statutory period for response set to expire on December 23, 2002. Please reconsider the claims pending in the application for reasons discussed below.

Claims 1-37 remain pending following entry of this response. New claim 37 has been added to recite aspects of the invention. Applicants submit that the new claim does not introduce new matter and does not constitute matter requiring another search.

Claims 1, 4, 5, 6, 8, 9, 11, 14, 15, 16, 18, 19, 20, 26, 27 and 32-36 stand rejected under 35 U.S.C. § 102(a) as being anticipated by *Elliott et al.*, U.S. 5,690,540 (hereinafter *Elliott*). Applicant respectfully traverses the rejection.

The Examiner states that *Elliott* discloses a semiconductor polishing device with one surface defining at least one non-intersecting fluid retaining groove, at least a portion of which is oriented at an angle relative to a radial line originating at its center, is adapted to flow a fluid inwardly toward a center portion of its surface, and is adapted to be used with a rotary polisher. The Applicants respectfully traverse the rejection.

All of the Applicants' arguments of its previous response are incorporated herein by reference. As was mentioned previously by the Applicant, the grooves of *Elliot* are intersecting. However, in his Final Office Action the Examiner states that the grooves of *Elliot* are non-intersecting. While the Examiner and the Applicants agree that the grooves of *Elliot* originate at a center 66, the Examiner suggests that the center 66 is not an intersection. Respectfully, Applicants submit that such a conclusion requires an interpretation of the term "intersecting" which is contrary to its ordinary meaning. *Websters Collegiate Dictionary* defines "intersect" as (1) to meet and cross at a point; and (2) to share a common area. By way of illustration, the common point at which two

roads meet is referred to as a "four-way intersection". Therefore, the grooves of Elliot intersect one another at the center 66.

The Examiner further states, however, that non-intersecting grooves are well-known and that a number of relevant references have been cited. Applicants respectfully request that the references in support of the Examiner's statement be specifically pointed out so that the best available art can be considered and addressed by the Applicants.

Claims 3 and 17 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over *Elliott et al.* The Examiner correctly states that *Elliott* does not disclose a groove having a varying slope. However, the Examiner states that it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the pad of *Elliott* to change the depth of the groove to increase or decrease to flow rate, hence the quantity, of the slurry. The Applicants respectfully traverse the rejection.

As noted previously by the Applicants, *Elliott* provides definitive groove configuration limitations. In particular, *Elliott* discusses the effects of groove depth, width and pitch. (See, column 4, lines 20-31.) In the case of depth, the grooves disclosed in *Elliott* are substantially uniformly deep along their lengths. (See, Figure 2.) *Elliott* suggests that the depth of a groove may be selected according to a desired flow slurry rate. However, because the groove configuration of *Elliott* is limited to providing slurry to a center of a polishing pad, *Elliott* does not contemplate varying a groove depth along its length. Therefore, *Elliott* does not teach, show or suggest a groove with a varying depth. For these reasons, a person skilled in the art would not be motivated by *Elliott* to use a groove with a varying depth.

In response to the foregoing argument, the Examiner states that *Elliott* teaches that optimizing the specific configuration of the groove will depend upon experimental results. However, because groove slope is not taught, shown or suggested by *Elliott* as a parameter capable of being manipulated, it follows that it cannot be "optimized". Respectfully, the Examiner's interpretation of *Elliott's* statement gives such broad scope to self-serving language as to foreclose innovation in the face of even the most substance-less disclosure.

Claims 2, 12, 13, 23, 24, 28, 30 and 31 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over *Elliott* in view of *Beardsley et al.*, U.S. 6,299,515 (hereinafter *Beardsley*). The Applicants respectfully traverse the rejection.

For the reasons discussed above, the rejection is obviated based on *Elliott* alone. *Beardsley* is directed to a patterned platen for transporting slurry. Thus, *Elliott* is exclusively directed to grooves in a polishing surface of a pad and *Beardsley* is exclusively directed to grooves in a platen. Further, *Beardsley* delivers slurry from the platen through the pad and onto the polishing surface of the pad. In contrast, *Elliott* delivers slurry directly onto the polishing surface of the pad. As a result, the slurry dispenser of *Beardsley* is suited only for slurry delivery to a platen and the slurry dispenser of *Elliott* is suited only for slurry delivery to a pad. Therefore, a person skilled in the art would not be motivated to combine *Elliott* with *Beardsley* because any effort to do so would result in an inoperative device due to the incompatibility of slurry delivery devices. Therefore, the rejection is improper. M.P.E.P. §2143.01.

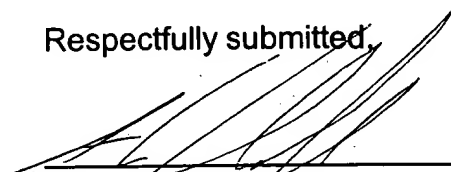
Claims 7, 10, 21, 22, 25 and 29 stand rejected under 35 U.S.C. 103(a) as being unpatentable over *Elliott et al.* in view of *Beardsley et al.* and further in view of *Okamura et al.*, U.S. 6,332,830 (hereinafter *Okamura*).

For the reasons discussed above, the rejection is obviated based on *Elliott* and *Beardsley* alone or in combination. *Okamura* is directed to a polishing apparatus including a turn table (2) disposed on a patterned surface of a turntable receiving member (3a). The grooves are not formed between a pad and platen, but between a turn table (2) and a turntable receiving member (3a). Further, the structure of the grooves accommodates the distribution of contact pressure, but does not allow for transfer of slurry to a desired region of the pad. Therefore, *Okamura* has no relevance to the pending claims and does not teach, show or suggest fluid-retaining grooves to transfer fluid to a desired region of a pad during polishing of a substrate.

In conclusion, the references cited by the Examiner, neither alone nor in combination, teach, show, or suggest the method or apparatus of the present invention. Having addressed all issues set out in the office action, Applicants respectfully submit that the claims are in condition for allowance and respectfully request that the claims be allowed.

The prior art made of record is noted. However, it is believed that the secondary references are no more pertinent to the Applicants' disclosure than the primary references cited in the office action. Therefore, it is believed that a detailed discussion of the secondary references is not deemed necessary for a full and complete response to this office action. Accordingly, allowance of the claims is respectfully requested.

Respectfully submitted,



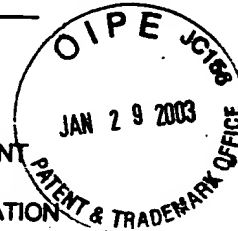
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SERIAL No.: 09/728,038
FILED: 12/1/2000
APPLICANT: Applied Materials Inc
INVENTOR: Chen et al

The Patent & Trademark Office acknowledges and has stamped hereon the date of receipt of the items checked below which were mailed 1/23/2003

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EXHIBIT B